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Age, metallicity and α-elements abundance in stellar population

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Abstract.
We built modelled spectra of stellar population at high resolution and with variable α-elements enhancements. Analysing spectra of Galactic globular clusters we show that it is possible to derive reliably and efficiently [Mg/Fe] using spectra integrated along the line-of-sight. These detailed measurements open perspectives for investigating the enrichment process on galaxies and star clusters.

Flux recalibrated CFLIB library. The CFLIB stellar library (or IndoUS; Valdes et al. 2004) contains spectra of 1273 stars observed in the wavelength range 3460-9464 $\AA$ at a spectral resolution FWHM=1 $\AA$ (R≈5000). The selection of the stars provides a good coverage of the T_{eff}, $\log g$, [Fe/H] space. In the initial release, the spectra were flux calibrated using the templates of Pickles (1998). This calibration was inaccurate for two main reasons: (1) the metallicity dependency of the spectral energy distribution (SED) was neglected, and (2) it relied on the precision of the atmospheric parameters. To generate high quality stellar population models, we corrected the flux calibration using the MILES library (Sánchez-Blázquez 2006) that has a lower spectral resolution, but has almost the same spectral coverage and an accurate flux calibration. The recalibrated library will be publicly available in the near future.

Modelled spectra of stellar population with α-enhancement. To build population models with parametric α-elements we followed the recipe of Prugniel et al. (2007): The empirical library, supposed to have the α/Fe pattern of the solar neighbourhood, is differentially corrected for the effect of variable abundance using the Coelho et al. (2005) library. Two semi-empirical grids are produced with $[Mg/Fe] = 0$ and $+0.4$. Intermediate values are linearly interpolated as a function of the mass ratio of Mg to Fe.

Single stellar population (SSP) models are built using Pegase.HR (Le Borgne et al. 2004) and the solar-scaled isochrones of Padova group. The drawback of not using enhanced isochrones (Salasnich et al. 2000) may essentially affect the ages (the enhanced isochrones are bluer).

To determine the age, [Fe/H] and [Mg/Fe] of a population from its spectrum, we use the full spectrum fitting method discussed in Koleva et al. (2006). It is implemented as a simple χ^2 minimisation where the free physical parameters of the model are those of the population mix, plus the internal kinematics. In

addition to the physical free parameters, the model contains a multiplicative polynomial making the process insensitive to the shape of the continuum, just like the classical Lick indices. This procedure has been found to be reliable and to give a three times better precision than Lick indices due to the optimised usage of the information. We performed Monte-carlo simulations and we have seen that there is no degeneracy between Age-[Mg/Fe] or [Fe/H]-[Mg/Fe]. The absence of degeneracy between [Mg/Fe] and age allows to grant some confidence to the retrieved values of [Mg/Fe], since the uncertainties on the evolutionary tracks will mostly bias the age and not the other parameters.

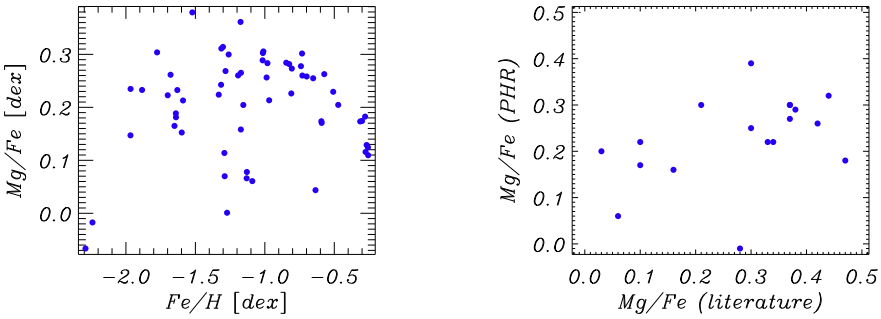

Figure 1. *Left:* Distribution of the [Mg/Fe] as a function of [Fe/H] for GGCs. *Right:* Comparison between our values and the one from the literature.

Application to globular clusters. We analysed the spectra of Galactic globular clusters from Schiavon et al. (2005). The distribution of [Mg/Fe] is shown on Fig. 1 with a comparison with the compilation of spectroscopic abundances (Pritzl, Venn & Irwin 2005, Tantalo, Chiosi & Piovan 2007). There is a satisfactory agreement between the enhancement measured from stellar spectroscopy and our measurements from line-of-sight integrated spectra. The measurement of [Mg/Fe] from integrated spectra using full spectrum fitting is reliable and more precise than with Lick indices.

References

P. Coelho, B. Barbuy, J. Meléndez, R. Schiavon, B. Castilho 2005, A&A, 443, 735
M. Koleva, N. Bavouzet, I. Chilingarian, Ph. Prugniel, arXiv:astro-ph/0602362v1
D. Le Borgne,B. Rocca-Volmerange,Ph. Prugniel, A. Lançon, M. Fioc, C. Soubiran 2004, A&A, 425, 881L
A. J. Pickles 1998, PASP, 110, 863
Ph. Prugniel, M. Koleva, P. Ocvirk, D. Le Borgne, C. Soubiran 2007, arXiv:astro-ph/0703130v1
B. Pritzl, K. Venn, M. Irwin 2005, IAUS, 228, 407
B. Salasnich, L. Girardi, A. Weiss, C. Chiosi 2000, A&A, 361, 1023
P. Sánchez-Blázquez et al. 2006, MNRAS, 371, 703
R. Schiavon, J. Rose, S. Courteau, L. MacArthur 2005, ApJS, 160, 163
R. Tantalo, C. Chiosi, L. Piovan 2007, A&A, 462, 481
F. Valdes, R. Gupta, J. A. Rose, H. P. Singh, D. J. Bell 2004, ApJS, 152, 251